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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/781,040	02/18/2004	Dmitry Lubomirsky	008266/CMP/ECP	8367

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EXAMINER	
VAN, LUAN V	

ART UNIT	PAPER NUMBER
1753	

DATE MAILED: 12/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/781,040	LUBOMIRSKY ET AL.	
	Examiner	Art Unit	
	Luan V. Van	1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 September 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *22 September 2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless -
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-4, 7-9, 11-13 and 15-17 are rejected under 35 U.S.C. 102(e) as being anticipated by Dordi et al. '578.

Regarding claims 1 and 8, Dordi et al. '578 teach an electroplating method, comprising: loading a substrate into a receiving member configured to support the substrate in a face down orientation (column 33 lines 33-47); tilting the receiving member to a first tilt angle measured from horizontal (column 34 lines 30-54); displacing the receiving member toward the fluid solution at the first tilt angle (column 34 lines 55-64); and tilting the receiving member to a second tilt angle or processing angle (column 38 lines 41-57) measured from horizontal when the substrate contacts the fluid solution, the second tilt angle being different from the first tilt angle.

Regarding claims 2 and 12, Dordi et al. '578 teach an electroplating method wherein the first tilt angle is between about 0 and 90 degrees (column 35 lines 41-48), which is within the range of the instant claim.

Regarding claims 3 and 13, Dordi et al. '578 teach an electroplating method wherein the second tilt angle is horizontal or about 0 degrees (column 38 lines 41-57).

Regarding claims 4 and 9, Dordi et al. '578 teach an electroplating method wherein the receiving member is rotated at a rotation rate of between about 0 rpm and about 200 rpm (column 38 lines 62-67).

Regarding claims 7 and 11, Dordi et al. '578 teach an electroplating method wherein the plating surface of the substrate is positioned parallel to an upper surface of an anode positioned in the fluid solution once the substrate is immersed In the fluid solution. The anode is positioned horizontally (figure 6, anode assembly 474), therefore the substrate is positioned parallel to the anode when the substrate is in the horizontal position.

Regarding claim 15, Dordi et al. '578 teach an electroplating method, comprising: positioning the substrate on a contact ring (column 33 lines 33-47); securing the substrate to the contact ring with a thrust plate assembly (column 33 lines 33-47); tilting the contact ring to a tilt angle of between 0 and 90 degrees (column 35 lines 41-48),

which is within the range of the instant claim; vertically actuating the contact ring toward the plating electrolyte while maintaining the tilt angle (column 34 lines 55-64); rotating the contact ring at a rotation rate of between about 0 rpm and about 200 rpm (column 38 lines 62-67); reducing the tilt angle to about horizontal (column 38 lines 41-57) when the contact ring initially touches the plating electrolyte; and positioning the substrate in a processing position (column 38 lines 41-57).

Regarding claim 16, Dordi et al. '578 teach an electroplating method wherein the second tilt angle is horizontal or about 0 degrees (column 38 lines 41-57).

Regarding claim 17, Dordi et al. '578 teach an electroplating method wherein the plating surface of the substrate is positioned parallel to an upper surface of an anode positioned in the fluid solution once the substrate is immersed In the fluid solution. The anode is positioned horizontally (figure 6, anode assembly 474), therefore the substrate is positioned parallel to the anode when the substrate is in the horizontal position.

Claims 1-4, 7-9 and 11-14 are rejected under 35 U.S.C. 102(e) as being anticipated by Sendai et al.

Regarding claims 1 and 8, Sendai et al. teach an electroplating method, comprising: loading a substrate into a receiving member configured to support the substrate in a face down orientation (paragraph 8); tilting the receiving member to a first

tilt angle measured from horizontal (paragraph 22); displacing the receiving member toward the fluid solution at the first tilt angle (paragraph 21); and tilting the receiving member to a second tilt angle or processing angle (paragraph 22) measured from horizontal when the substrate contacts the fluid solution, the second tilt angle being different from the first tilt angle.

Regarding claims 2 and 12, Sendai et al. teach an electroplating method wherein the first tilt angle is between about 2 and 10 degrees (paragraph 22), which is within the range of the instant claim.

Regarding claims 3 and 13, Sendai et al. teach an electroplating method wherein the second tilt angle is horizontal or about 0 degrees (paragraph 22).

Regarding claims 4 and 9, Sendai et al. teach an electroplating method wherein the receiving member is rotated at a rotation rate of between about 10 rpm and about 250 rpm (paragraph 23).

Regarding claims 7 and 11, Sendai et al. teach an electroplating method wherein the plating surface of the substrate is positioned parallel (figures 11-12) to an upper surface of an anode positioned in the fluid solution once the substrate is immersed In the fluid solution.

Regarding claim 14, Sendai et al. teach an electroplating method wherein the tilt angle is greater than 0 degrees at a time when the substrate becomes completely immersed in the fluid solution (paragraph 25).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 5, 6, 10 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dordi et al. '578 in view of Wang et al.

Dordi et al. '578 teach the method as described above in addressing claim(s) 1, 8 and 15.

The difference between the reference to Dordi et al. '578 and the instant claims is that the reference does not explicitly teach oscillating the substrate.

Wang et al. teach that it is desirable "to vibrate the substrate, e.g., substantially vertically and/or horizontal [sic], relative to the electrolyte solution" (paragraph 81) in order to "enhance the fluid flow of the electrolyte solution into the features contained on the plating surfaces."

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Dordi et al. '578 by vibrating or oscillating the substrate as taught by Wang et al., because it would enhance the fluid flow of the electrolyte solution into the features contained on the plating surfaces, and because it would enhance metal film deposition rate within the features.

Claims 14, 18 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dordi et al. '578 in view of either Sendai et al. or Lumbomirsky et al.

Dordi et al. '578 teach the method as described above in addressing claim(s) 1, 8 and 15.

The difference between the reference to Dordi et al. '578 and the instant claims is that the reference does not explicitly teach the tilt angle is greater than 0 degrees at a

time when the substrate becomes completely immersed in the fluid solution (claim 14); the anode is tilted (claim 18); nor the central axis of the substrate proximate is centered on the electrolyte solution (claim 20).

Sendai et al. teach an electroplating method wherein the tilt angle is greater than 0 degrees at a time when the substrate becomes completely immersed in the fluid solution (paragraph 25); the anode is tilted from horizontal at an angle of between about 1 and 10 degrees (paragraph 91); and the central axis of the substrate proximate is centered on the electrolyte solution (figures 11-12).

Lumbomirsky et al. teach an electroplating method wherein the tilt angle is greater than 0 degrees at a time when the substrate becomes completely immersed in the fluid solution (paragraph 12); the anode is tilted from horizontal at an angle of between about 3 and 30 degrees (paragraph 25), since the anode is tilted to the corresponding tilt angle of the substrate support assembly; and the central axis of the substrate proximate is centered on the electrolyte solution (figure 1).

Addressing claim 14, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Dordi et al. '578 by tilting the substrate when the substrate is completely immersed in the fluid solution as taught by either Sendai et al. or Lumbomirsky et al., because it would

prevent air bubbles from remaining on the surface to be plated and prevent plating film defects.

Addressing claim 18, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Dordi et al. '578 by tilting the anode as taught by either Sendai et al. or Lumbomirsky et al., because it would maintain a parallel orientation with the substrate surface when the substrate is tilted in order to prevent air bubbles from remaining on the surface to be plated and in order to enhance plating uniformity.

Addressing claim 20, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Dordi et al. '578 by maintaining the central axis of the substrate proximately centered on the electrolyte solution as taught by either Sendai et al. or Lumbomirsky et al., because it would enhance plating uniformity.

Claims 15-18 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sendai et al. in view of Dordi et al. '578.

Regarding claim 15, Sendai et al. teach an electroplating method, comprising: loading a substrate into a ring-shaped substrate holding portion 42 with electrode contacts 46 (figure 6); tilting the receiving member to a first tilt angle measured from

horizontal (paragraph 22); displacing the receiving member toward the fluid solution at the first tilt angle (paragraph 21); and tilting the receiving member to a second tilt angle or processing angle (paragraph 22) measured from horizontal when the substrate contacts the fluid solution, the second tilt angle being different from the first tilt angle.

The difference between the reference to Sendai et al. and the instant claims is that the reference does not explicitly teach using a thrust plate assembly to secure the substrate.

Dordi et al. '578 teach a thrust plate assembly to secure the substrate (column 36 line 33-58).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Sendai et al. by using a thrust plate assembly to secure the substrate as taught by Dordi et al. '578, because a thrust plate assembly secures the substrate in order for the substrate to be rotated.

Regarding claim 16, Sendai et al. teach an electroplating method wherein the second tilt angle is horizontal or about 0 degrees (paragraph 22).

Regarding claim 17, Sendai et al. teach an electroplating method wherein the plating surface of the substrate is positioned parallel (figures 11-12) to an upper surface

of an anode positioned in the fluid solution once the substrate is immersed In the fluid solution.

Regarding claim 18, Sendai et al. teach an electroplating method wherein the anode is tilted from horizontal at an angle of between about 1 and 10 degrees (paragraph 91).

Regarding claim 20, Sendai et al. teach an electroplating method wherein the central axis of the substrate proximate is centered on the electrolyte solution (figures 11-12).

Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sendai et al. in view of Dordi et al. '578, and further in view of Wang et al.

Sendai et al. and Dordi et al. '578 teach the method as described above in addressing claim(s) 15.

The difference between the references and the instant claim is that the references do not explicitly teach oscillating the substrate.

Wang et al. teach that it is desirable "to vibrate the substrate, e.g., substantially vertically and/or horizontal [sic], relative to the electrolyte solution" (paragraph 81) in

order to "enhance the fluid flow of the electrolyte solution into the features contained on the plating surfaces."

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the combined method of Sendai et al. and Dordi et al. '578 by vibrating or oscillating the substrate as taught by Wang et al., because it would enhance the fluid flow of the electrolyte solution into the features contained on the plating surfaces, and because it would enhance metal film deposition rate within the features.

Claims 5, 6 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sendai et al. in view of Wang et al.

Sendai et al. teach the method as described above in addressing claim(s) 1, 8 and 15.

The difference between the reference to Sendai et al. and the instant claims is that the reference does not explicitly teach oscillating the substrate.

Wang et al. teach that it is desirable "to vibrate the substrate, e.g., substantially vertically and/or horizontal [sic], relative to the electrolyte solution" (paragraph 81) in

order to "enhance the fluid flow of the electrolyte solution into the features contained on the plating surfaces."

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Sendai et al. by vibrating or oscillating the substrate as taught by Wang et al., because it would enhance the fluid flow of the electrolyte solution into the features contained on the plating surfaces, and because it would enhance metal film deposition rate within the features.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Luan V. Van whose telephone number is 571-272-8521. The examiner can normally be reached on M-F 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

LVV
11/18/05

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